SEE Testing of the TGL4302
(DC- 50GH, 0.25um GaAs pHEMT MMIC voltage variable attenuator)
Manufactured by Triquint

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1. Introduction

Heavy-ion testing of the TGL4302 MMIC voltage variable attenuator was carried out at TAMU Cyclotron Facility to determine the part's sensitivity to transients and to single event destructive failure.

2. Device Configuration and Operation

The TGL4302 device was mounted in a brass holder as shown in figure 1. There is no date code information on the device.

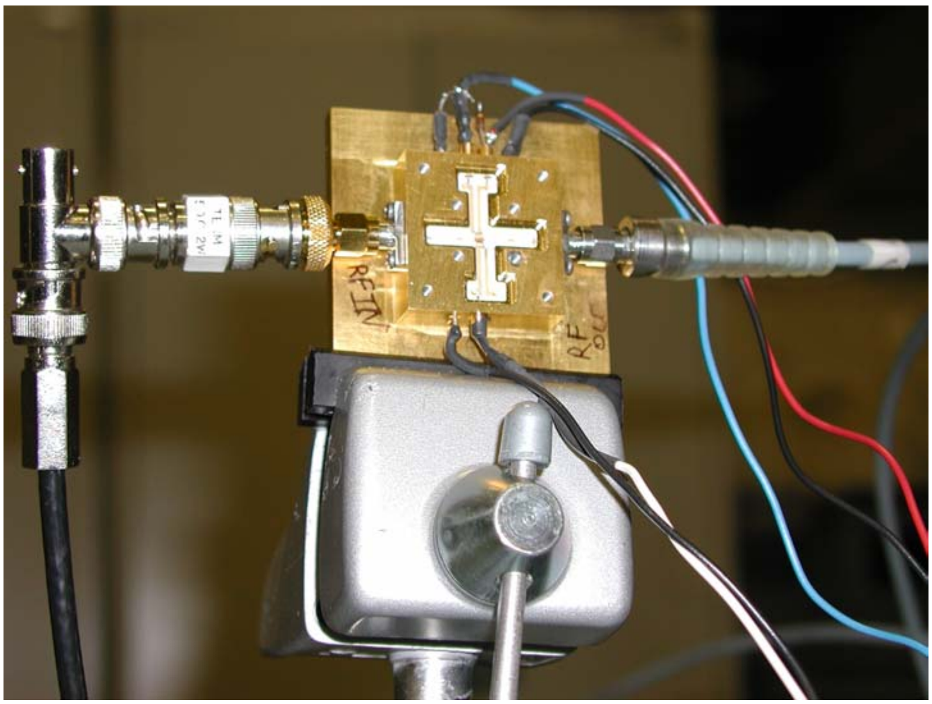

Fig. 1. Picture showing the MMIC. RF Input is on the left, RF output is on the right and the source voltage input is at the top.

The RF input consisted of a sine wave with frequency 50 MHz and amplitude 0.632 V peak-to-peak centered at 0 Volts. The input was applied to the transistor's gate. A signal with a constant voltage (10 V) was applied to the source of the transistor. The output signal of the transistor was applied to the input of a Tektronix TDS784C oscilloscope. The DC power supply, sine wave generator and oscilloscope were controlled remotely using LabVIEW.

3. Transient Detection

For detecting transients in the sine wave, the oscilloscope was set in the "envelope" mode such that if the signal sine wave differed from the reference sine wave by at least 40 mV (in some cases 30 mV), the oscilloscope would be triggered and the transient waveform would be captured. With the envelope set at 20 mV, the oscilloscope would trigger on noise in the system, giving us assurance that the parameters for the "envelope" mode were correctly set for detecting transients. Figure 2 shows an example of the sine wave captured from the oscilloscope with no transients.

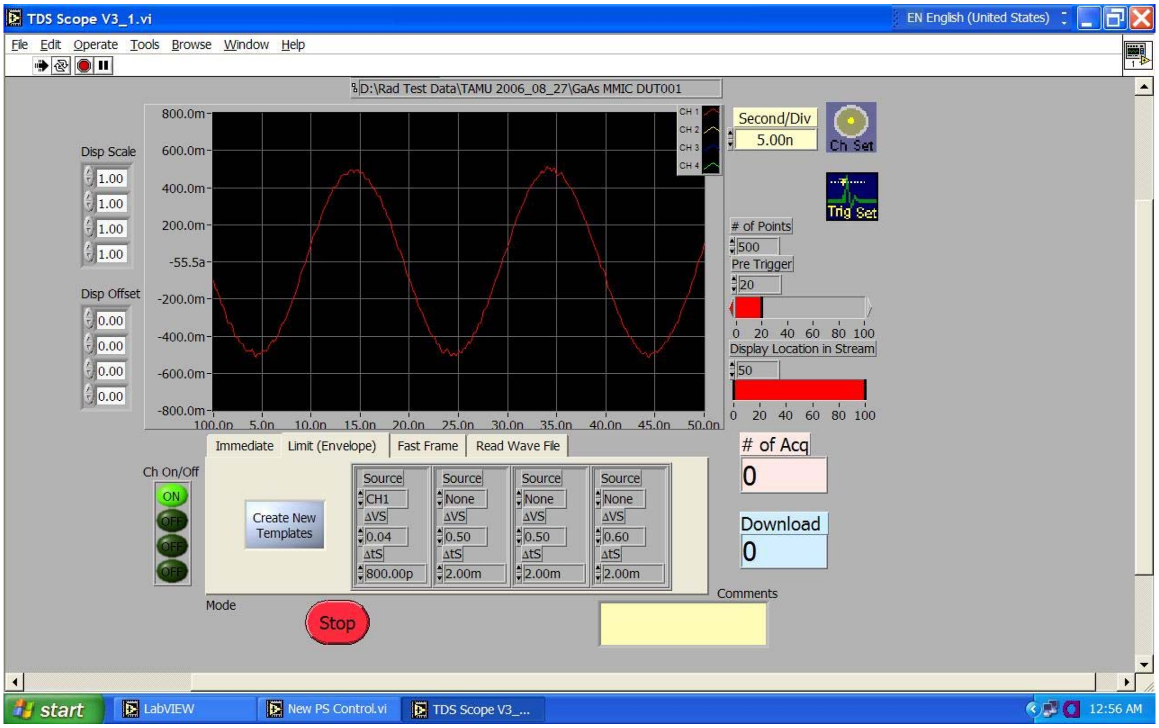

Figure 2. Screen capture of the LabView control screen used for testing the MMIC.

4. Results

Table I shows the results of the test. No transients were observed for LETs up to 78.4 MeV.cm^2/mg. For runs 1 through 7 the trigger was set at +/- 40 mV and for run 8 the trigger was set at 30 mV.

Table I

Results of SET Testing of the MMIC Transistors.

Run #	Part	Ion	LET	Angle	Effective LET	Time	Flux	Effective Fluence	# of Transients	Cross-Section
1	MMIC	Ar (15MeV)	6.4	0	6.40	80	1.28E+03	1.02E+05	0	0
2	MMIC	Ar (15MeV)	6.4	45	9.05	118	8.90E+02	1.05E+05	0	0
3	MMIC	Ar (15MeV)	6.4	60	12.80	812	6.17E+02	5.01E+05	0	0
4	MMIC	Kr (15MeV)	21.4	0	21.40	592	1.69E+04	1.00E+07	0	0
5	MMIC	Kr (15MeV)	21.4	45	30.26	834	1.20E+04	1.00E+07	0	0
6	MMIC	Kr (15MeV)	21.4	60	42.80	1132	8.83E+03	1.00E+07	0	0
7	MMIC	Xe (15 MeV)	39.2	0	39.20	906	1.10E+04	1.00E+07	0	0
8	MMIC	Xe (15 MeV)	39.2	60	78.40	1559	6.41E+03	1.00E+07	0	0

5. Conclusion

The part exhibited no destructive single event failures and no single event transients up to an LET of 78.4 $MeV.cm^2/mg$ to a fluence of $1x10^7$ $particles/cm^2$.